Decision Rationale

Total Maximum Daily Loads for
the Aquatic Life Use Impairment on Cockran Spring Branch, Lacey Spring Branch, Orndorff Spring Branch, Pheasanty Run, Wallace Mill Stream and Montebello Spring Branch

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the Environmental Protection Agency's (EPA) rationale for approving the TMDLs for the aquatic life use (benthic) impairment for trout farm impaired waters (Cockran Spring Branch, Lacey Spring Branch, Orndorff Spring Branch, Pheasanty Run, Wallace Mill Stream and Montebello Spring Branch). EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to
40 CFR §130.

1) The TMDLs are designed to implement applicable water quality standards.
2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.
3) The TMDLs consider the impacts of background pollutant contributions.
4) The TMDLs consider critical environmental conditions.
5) The TMDLs consider seasonal environmental variations.
6) The TMDLs include a margin of safety.
7) There is reasonable assurance that the TMDLs can be met.
8) The TMDLs have been subject to public participation.

II. Background

The six trout farm impaired waters are located in the Shenandoah River and James River watersheds. Cockran Spring Branch is located in Augusta County, Virginia. The listed segment is 0.8 miles in length, with a 940 acre watershed. The segment originates at the trout farm outfall and terminates at the stream's confluence with Middle River. Pasture lands and hayfields (79%) and forested lands (21%) make-up the entire watershed.

Lacey Spring Branch is located in Rockingham County, VA. The listed segment in 0.2 miles in length, beginning at the trout farm effluent and continuing to its confluence with Smith Creek. The watershed is 335 acres and the land uses are pasture (58%), residential (28%), roadways (9%) and forested (5%) lands.

Orndorff Spring Branch is located in Shenandoah County, VA. The impaired segment is 0.15 miles in length originating at the trout farm outfall and terminating at its confluence with Cedar Creek. The watershed is approximately 8 acres in size and the land uses are mixed forests (69%), deciduous forest (16%), roadways (14%) and cropland (1%).

Pheasanty Run is located in Bath County, VA. The watershed was listed on the 1998 Section 303(d) list as Coursey Spring Branch. The impaired segment is 0.43 miles beginning at the trout farm discharge and continuing to its confluence with Cowpasture River. The watershed is 1,320 acres in size and consists of forested (64%), pasture (33%) and developed (3%) lands.

Casta Line Spring Branch, known as Wallace Mill Stream in the TMDL, is located in Augusta County, VA. The listed segment is 0.8 miles in length originating at the trout farm outfall and continuing to its confluence with Byrd Spring Branch. The watershed is 1,450 acres and consists of deciduous forest (81%), pasture (17.5%) and residential (1.5%) lands.

Montebello Spring Branch is located in Nelson County, VA. The impaired segment is 0.02 miles in length originating at the trout farm outfall and continuing to its confluence with Mill Creek. The watershed is 290 acres and consists of deciduous forest (94%), the trout facility (2.5%), evergreen forests (1.5%) and roads (1%).

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed all of the aforementioned streams on Virginia's 1998 Section 303(d) list as being unable to attain the general standard for aquatic life use. The failure to attain the general standard for aquatic life use was determined through biological assessments of the benthic macroinvertebrate community.

Virginia 305(b)/303(d) guidance states that support of the aquatic life beneficial use is determined by the assessment of conventional pollutants (dissolve oxygen, pH, and temperature); toxic pollutants in the water column, fish tissue, and sediments; and biological evaluation of benthic community data.[1] Therefore, a biological assessment of the benthic community can be used to determine a stream's compliance with the state's general standard for aquatic life use. Virginia uses EPA's Rapid Bioassessment Protocol (RBPII) to determine status of a stream's benthic macroinvertebrate

[1]VADEQ. 1997. 1998 Water Quality Assessment Guidance for 305(b) Water Quality Report and 303(d) TMDL Priority List Report. Richmond, VA.

community.[2] This approach evaluates the benthic macroinvertebrate community between a monitoring site and its reference station. Measurements of the benthic community, called metrics, are used to identify differences between monitored and reference stations.[3] The reference watershed approach was used to determine if a stream's benthic community was impaired and then to determine the load reductions needed to alleviate the impairment. In many cases the stream used as the reference watershed for the benthic evaluation was not used as the reference watershed for the determination of an allowable load.

Reference stations are established on streams which are minimally impacted by humans and have a healthy benthic community. Streams which are classified as moderately or severely impaired after an RBPII evaluation are classified as impaired and are placed on the Section 303(d) list of impaired waters. During the 1998 assessment period, all of these streams were evaluated as either moderately or severely impaired. The biological reference sites for these streams were Mount Solon Spring Branch (Cockran Spring Branch, Lacey Spring Branch, and Pheasanty Run), Ingleside Spring Branch (Orndorff Spring Branch and Wallace Mill Stream) and Mill Creek (Montebello Spring Branch). The biological reference sites were used to determine if the benthic community of the monitored sites was impaired.

The RBPII assesses the health of the macroinvertebrate community of a stream. The analysis will inform the biologist if the stream's benthic community is impaired. However, it will not inform the biologist as to what is causing the degradation of the benthic community. Additional analysis is needed to determine the pollutants which are causing the impairment. TMDL development requires the identification of impairment causes and the establishment of numeric endpoints that will allow for the attainment of designated uses and water quality criteria.[4] A reference watershed approach was used to determine the stressors and the endpoints for these TMDLs. Numeric endpoints represent the water quality goals that are to be achieved through the implementation of the TMDL and will allow a stream to

---

[2]Tetra Tech 2002. Total Maximum Daily Load (TMDL) Development for Blacks Run and Cooks Creek. Fairfax, Virginia.

[3]Supra 2

[4]Supra 2

attain its designated uses. A reference watershed approach is based on selecting a non-impaired watershed that shares similar land use, ecoregion, and geomorphological characteristics with the impaired watershed.[5] The stream conditions and loadings in the reference stream are assumed to be the conditions needed for the impaired stream to attain standards.

In several cases the reference site for the biological assessment was not used as the reference site for load determination. The reference site used for the determination of the loadings for all of the streams within the TMDL report was Ingleside Branch. Mount Solon Branch was not used as the reference site for loadings to Lacey Spring Branch since the loadings obtained using Mount Solon Branch as a reference were unrealistic. If Mount Solon Branch was used, the spring would still require a 67% reduction in loadings after the removal of all point and nonpoint source loadings. Mount Solon Branch was not used as the reference (loadings) for Pheasanty Run because Ingleside Spring Branch was determined to be a better reference site (for the loadings to Pheasanty Run) since it more accurately reflected the streams water chemistry and scored higher in the benthic assessments. Using Mount Solon Branch as a loadings reference site was also discouraged since a point source loading to the stream was not quantified.

Since it would require the elimination of most point and nonpoint sources, Mill Creek was not seen as a suitable reference stream for loadings to Montebello Spring Branch. The use of Mill Creek as a reference site for loadings would have required load reductions from deciduous forest. For additional information on the selection of a reference site, please refer to Section 3.4.3 of the benthic TMDL report.

[5]Supra 2

The TMDL evaluated several possible stressors to the streams. Ammonia was evaluated as a possible stressor in all of the streams but ruled out after data demonstrated that the ammonia concentrations were below toxic levels. Sampling data also ruled out the possibility of the sites being impacted by low dissolved oxygen, temperature or pH. The data collected from each of these sites was consistently above water quality standards (WQS). Toxic chemicals were ruled out based on the land uses within each of these watersheds; no industry, few homes and little cropland. Fish predation was seen as a possible stressor in some of these streams due to excessive trout numbers from stocking or escape. However, this theory could not be validated. Nutrients (nitrogen and phosphorous) were seen as probable stressors based on data collected within the watershed. Although, seen as a probable stressor, the TMDL does not address nutrient loadings specifically because it is believed that nutrient reductions will be achieved through the controls on organic solids. Organic solids were seen as the critical stressor to each of these streams. Solids in general have multiple deleterious effects on the benthic macroinvertebrate community.[6] Deposited solids that fill interstital spaces reduce habitat for macroinvertebrate species. Solids reduce the photosynthetic capabilities of aquatic plants and may affect the hunting efficiency of some species. Hydraulic load is clearly a stressor for one of the streams, Montebello Spring Branch. During drought conditions, this facility is unable to maintain a flow as the trout farm does not release any effluent but re-circulates its water. The TMDL originally was developed to recommend a minimum flow requirement for Montebello Spring Branch. However, in order to do this, the flow for Mill Creek would need to be diverted. Subsequent analysis showed that Mill Creek would not be able to supply enough water for Montebello Spring Branch. Therefore, this requirement was removed. For additional information on the critical stressors, please refer to Section 3.3 of the TMDL report.

The next step in developing these TMDLs was to determine the loadings of organic solids to the streams. The TMDLs assumed that 5% of the solids being delivered to the stream from nonpoint sources were organic solids, while 60% of the solids from the trout farms were organic solids. These assumptions were based on literature values and sampling data. The Revised Universal Soil Loss Equation (RUSLE) was used to determine the loads being delivered from nonpoint sources. RUSLE considers land use, management practices, rainfall intensity, topography, vegetative cover, soil type and watershed size in determining the nonpoint source loadings. The nonpoint source loads for the reference site were adjusted to address differences in watershed size. The RUSLE was applied to the 300 foot zone on each bank of the impaired segment. This was done because this area has the largest impact on the loadings. The point source loadings were based on the sampling and flow data from each trout farm.

---

[6]Virginia Tech, 2002. Benthic TMDL Reports for Six Impaired Stream Segments in the Potomac- Shenandoah and James River Basins.

Table 1 - Summarizes the Specific Elements of the TMDLs.

Segment	Parameter	TMDL (lbs/yr)	WLA (lbs/yr)	LA (lbs/yr)	MOS (lbs/yr)*
Cockran Spring Branch	Organic Solids	2,016	1,556	359	101
Lacey Spring Branch	Organic Solids	957	680	229	48
Orndorff Spring Branch	Organic Solids	127	103	17	7
Pheasanty Run	Organic Solids	1,582	1,231	271	80
Wallace Mill Stream	Organic Solids	3,451	2,839	439	173
Montebello Spring Branch	Organic Solids	141	37	97	7

* Virginia includes an explicit MOS by reserving the 10% of total loading to the MOS.

The United States Fish and Wildlife Service has been provided with copy of these TMDLs.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing aquatic life use (benthic) impairment TMDLs for the aforementioned waters. EPA is therefore approving these TMDLs. Our approval is outlined according to the regulatory requirements listed below.

1) The TMDL is designed to meet the applicable water quality standards.

The monitored sites were listed as impaired due to a degradation of the benthic macroinvertebrate community. As mentioned above, benthic assessments inform the biologist of an impairment, but they do not identify the stressor. Therefore, a reference watershed approach was used to identify the stressors to these streams. Virginia has indicated that excessive levels of organic solids and possibly nutrients have caused the degradation of the benthic community on these streams. The TMDLs quantified an allowable loading for organic solids; nutrients are expected to reduced with the loadings of organic solids. It is believed that if these loadings are obtained, that the impairment to the benthic community will be relieved. As discussed earlier, the RUSLE model was used to determine the nonpoint source loadings to the impaired streams and reference sites. Observed flow and monitoring data was used to determine the loadings from point sources to the streams. EPA believes that by using this approach to model and allocate the loadings to the impaired segments, the designated uses and water quality standards will be attained and maintained on these streams.

2) The TMDL includes a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of organic solids to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 1 of this document. The total allowable load is calculated on an annual basis.

Waste Load Allocations

Virginia has stated that there is one trout farm discharging to each of the impaired segments. The loading for each facility was determined by multiplying the average of the observed solids concentration by the flow. This number was then multiplied by 0.6 to determine the organic solids concentration. All of the trout farms (except the facility on Pheasanty Run and Montebello Spring) are permitted under Virginia general permit VAG131. Therefore, these permits begin with VAG131; Table 2 lists the waste load allocation (WLA) for each facility. An elementary school currently discharges to Lacey Spring as well.

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

Table 2 - Waste Load Allocations for Cooks Creek

Stream	Permit Number	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Cockran Spring	VAG131001	5,848	1,556	73%
Lacey Spring	VAG131005	11,481	222	98%
Lacey Spring	VA0077399	414	414	0%

Stream	Permit Number	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Orndorff Spring	VAG131000	4,438	103	97.7%
Pheasanty Run	VA006491	72,477	1,231	98%
Wallace Mill	VAG131002	4,958	2,814	43%
Montebello Spring	VA006505	1,823	37	98%

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), load allocations (LAs) are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings, VADEQ used the RUSLE model to represent the impaired watersheds. The RUSLE model determined the total solids transported to the stream from a 300 foot wide riparian zone on each side. Tables 3a - 3f documents the nonpoint source loadings for each stream.

Table 3a - LA for Organic Solids for Cockran Spring Branch

Land Use	Existing Load (lbs/yr)	Allocated Load	Percent Reduction
Headwaters (Spring)	9	9	0%
Pasture	600	350	42%
Total	609	359	41%

Table 3b -LA for Organic Solids for Lacey Spring Branch

Land Use	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Headwaters (Spring)	1,127	47	96%
Pasture/Grassy Field	110	52	53%

Roads/Grassy Slopes	155	155	0%
Residential	38	19	50%
Total	1,430	273	81%

Table 3c - LA for Organic Solids for Orndorff Spring Branch

Land Use	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Headwaters (Spring)	13	13	0%
Mixed Forest	2	2	0%
Deciduous Forest	2	2	0%
Driveway	0	0	0%
Hayfield	0	0	0%
Total	17	17	0%

Table 3d - LA for Organic Solids for Pheasanty Run

Land Use	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Headwaters (Spring)	0	0	0%
Grassy Field (Upstream of Impaired Segment)	138	55	60%
Road (Upstream of Impaired Segment)	124	124	0%
Forest (Upstream of Impaired Segment)	26	26	0%
Grassy Field	143	60	58%
Forest	6	6	0%
Total	437	271	68%

Table 3e - LA for Organic Solids for Wallace Mill Stream

Land Use	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Headwaters (Spring)	0	0	0%
Pasture/Grassy Field	532	325	39%
Deciduous Forest	82	82	0%

Residential	24	24	0%
Roads	33	33	0%
Total	671	464	31%

Table 3f - LA for Organic Solids for Montebello Spring Branch

Land Use	Existing Load (lbs/yr)	Allocated Load (lbs/yr)	Percent Reduction
Headwaters (Spring)	14	14	0%
Deciduous Forest	43	43	0%
Gravel Drive	40	40	0%
Total	97	97	0%

3) The TMDL considers the impacts of background pollution.

The TMDLs considered background loadings for the pollutant of concern in the analysis via sampling headwaters.

4) The TMDL considers critical environmental conditions.

According to the EPA regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the impaired streams is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[7]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum. The TMDLs considered the critical conditions for flow and loadings to these streams. Data

[7]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

was collected for these TMDLs during critical low flow events and observed discharge concentrations from the trout farms were considered in the analysis.

5) The TMDLs consider seasonal environmental variations.

Seasonal variations involve changes in stream flow as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods. Seasonality was addressed by collecting data in both the summer and winter seasons. Point source impacts were based on the seasonal feeding cycle associated with the trout farms. The RUSLE incorporates seasonality into the vegetative cover and rainfall parameters.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia includes used a 5% explicit MOS by reducing the reference watershed loading by 5%. This reduced load was transferred to the target watershed.

7) There is a reasonable assurance that the TMDL can be met.

EPA requires that there be a reasonable assurance that the TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program. Additionally, Virginia's Unified Watershed Assessment, an element of the Clean Water Action Plan, could provide assistance in implementing this TMDL.

Organic solids were identified as the likely critical stressor in all six impaired streams. Lowering the amount of organic solids reaching the stream should alleviate the benthic impairment on these streams. The TMDL report identified possible management techniques for each farm to take to lower the amount of organic solids being discharged through their effluent. Follow-up monitoring of these control measures and the effluent will be used to evaluate the effectiveness of these measures. For additional information on reasonable assurance, please see Section 13 of the TMDL report.

8) The TMDLs have been subject to public participation.

Two public meetings were held to discuss TMDL development on these impaired waters. Both of these meetings were public noticed in the *Virginia Register* and opened to a 30 day comment period. The meetings were held at DEQ's Valley Regional Offices in Harrisonburg, VA. The first meeting was held on June 12, 2001 and the second meeting was held on March 27, 2002. Approximately 20 people attended these meetings.